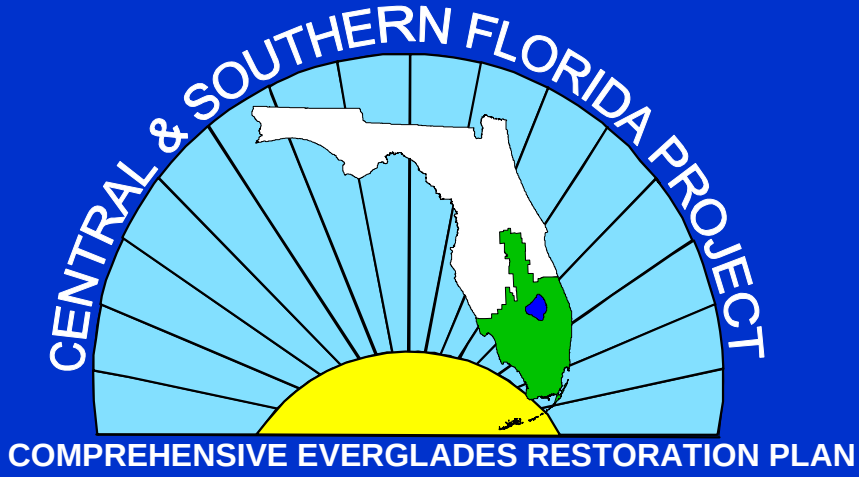
Aquifer Storage and Recovery in the Comprehensive Everglades Restoration Plan (CERP)



Water Resource Advisory Commission

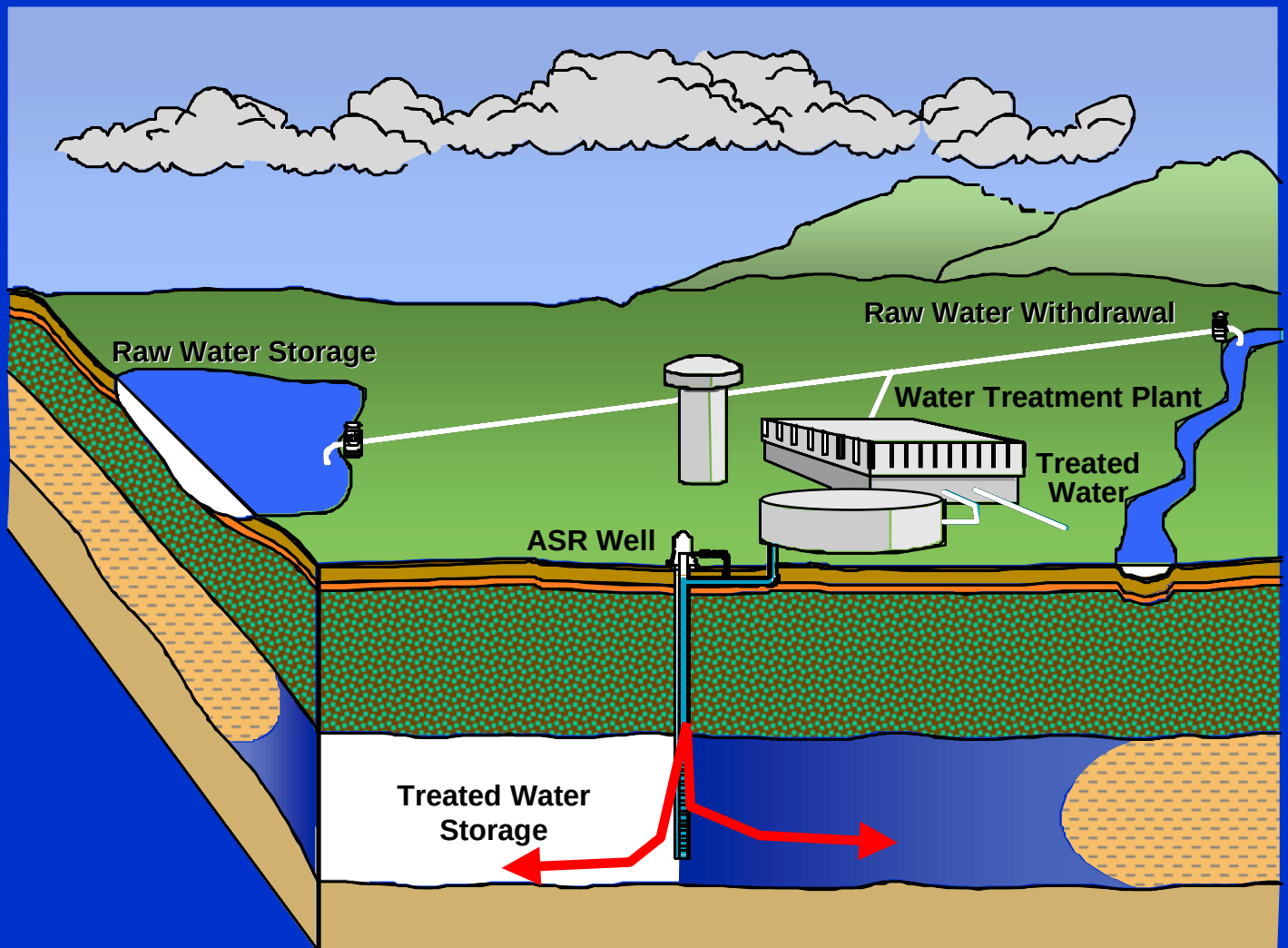
August 2, 2001

West Palm Beach, FL

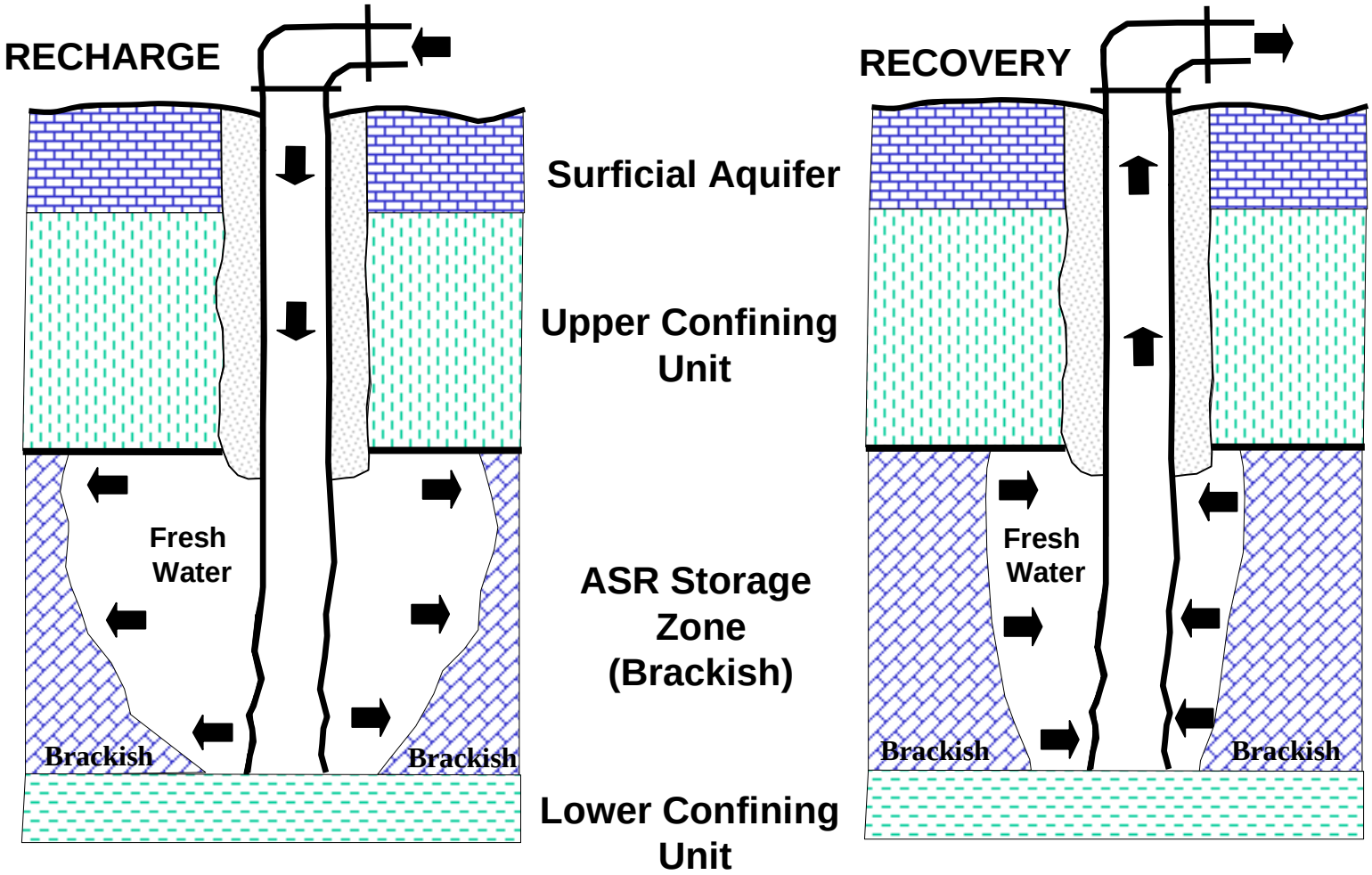
What is Aquifer Storage and Recovery (ASR)?

ASR may be defined as the storage of freshwater in a brackish-water aquifer, through wells, during wet periods for subsequent recovery from these same wells during dry periods.

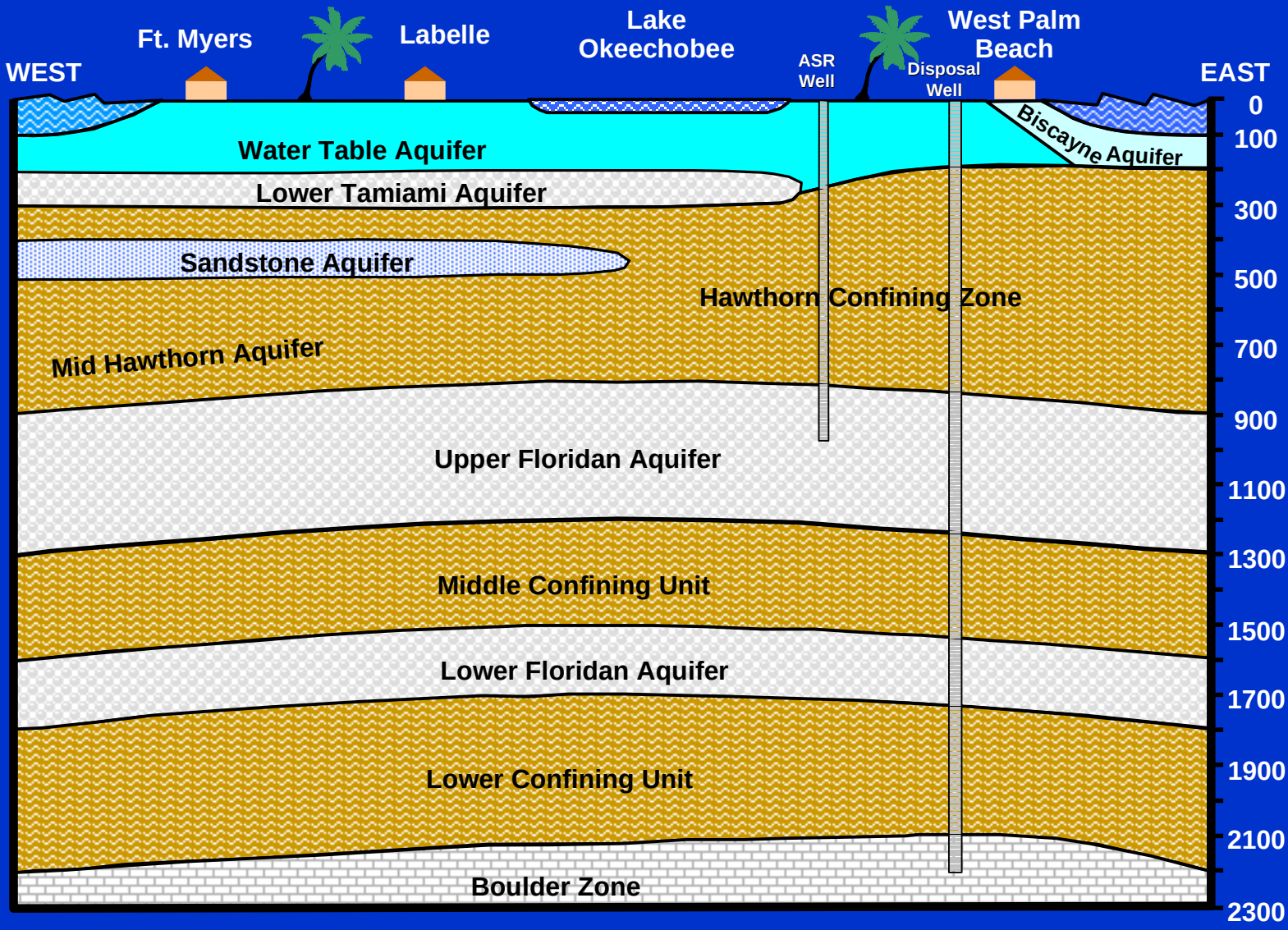
What is Aquifer Storage & Recovery (ASR) ?



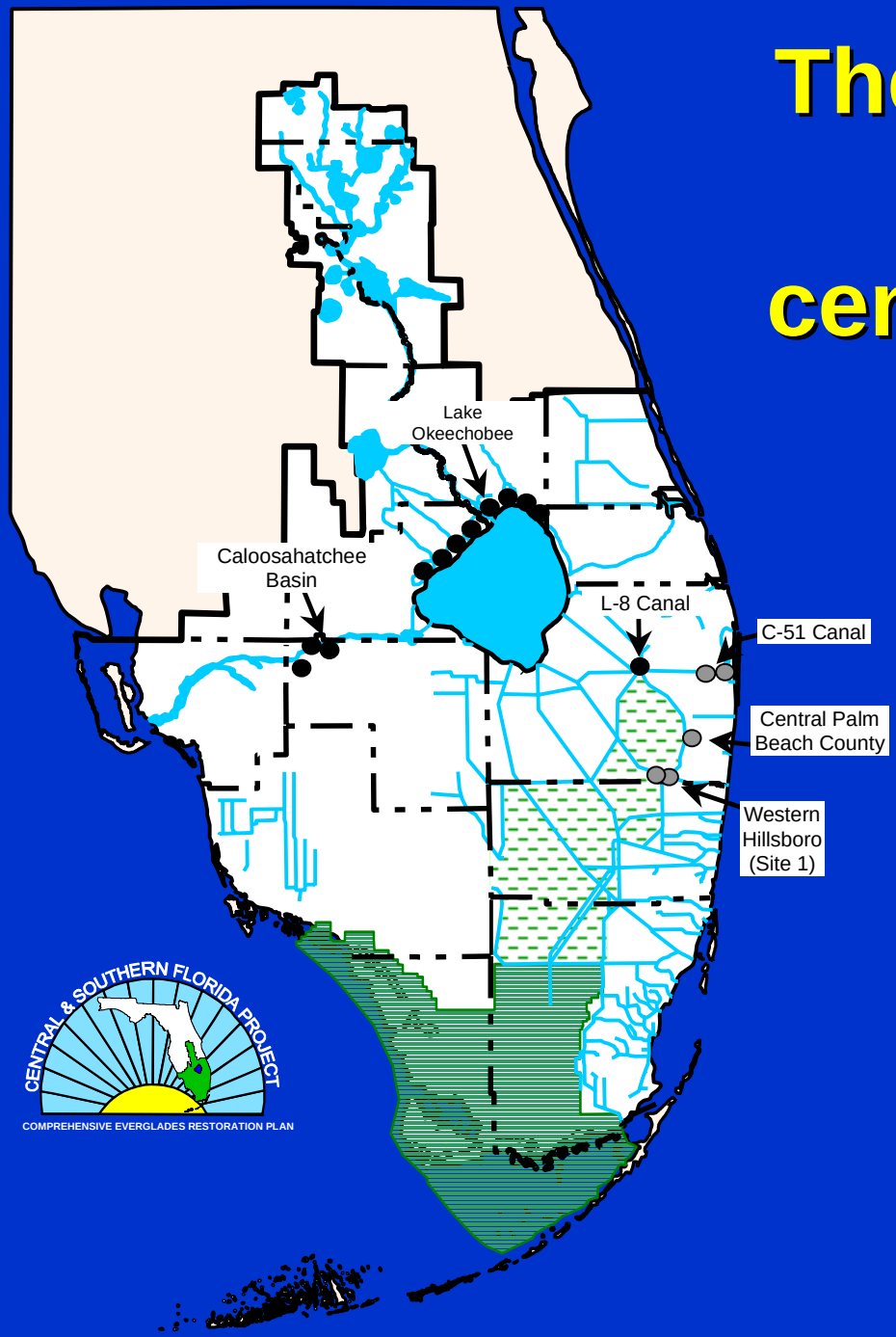
Aquifer Storage and Recovery Schematic



ASR Wells Tap a Shallower Zone in the Floridan Aquifer Than Deep Injection Wells



The majority of CERP ASR capacity is centered around Lake Okeechobee



Site	Capacity (mgd)
Lake Okeechobee	1,000
Caloosahatchee	220
L-8 Basin	50
C-51 Basin	170
Central PBC	75
Western Hillsboro	150
TOTAL	1,665

Note mgd = million gallons per day

General Benefits of Aquifer Storage and Recovery

- Ability to conduct long-term (multi-year) storage and recover this stored water during droughts, presumably when reservoir levels would be low
- Not subjected to evapotranspiration and seepage losses
- Limited land requirements (acre or two per well) result in significant cost savings compared to reservoirs
- Wells can generally be located in areas of greatest water availability and/or need

Benefits of Lake Okeechobee ASR

- Inject water from the lake for subsurface storage when lake levels are high
- Return water to the lake when levels are low to provide for downstream users
- Reduce wasteful and sometimes harmful discharges of water to coastal estuaries
- Better manage water level to enhance littoral zone ecosystem and fish populations

ASR Issue Team

1. Source-Water Quality Characterization
2. Characterize Regional Hydrogeology
3. Critical Pressure for Rock Fracturing
4. Regional Changes in Head and Flow
5. Water Quality Changes in Aquifer During Storage and Movement
6. Potential for Mercury Bioaccumulation
7. Relationship between Storage Interval, Recovery Rates, and Recharge Volume

IMPLEMENTATION STRATEGY

CERP ASR PROGRAM

RS **ASR Regional Study**

ASR Pilot Projects **PP**

ASR Regional Study

- Collect additional data and conduct further analyses (including groundwater modeling) to evaluate the performance of the regional, 333-well CERP ASR Program, and its impacts on the environment and existing users
- Status
  - Inter-agency Project Delivery Team currently developing Scope of Work
  - We need your input!!

ASR Pilot Projects

- Address Technical and Regulatory Uncertainties of Functional ASR systems
- Demonstrate Viability of Storing Partially Treated Surface Water or Groundwater into the Brackish, Floridan Aquifer for Subsequent Recovery
- Locations - Status
  - Lake Okeechobee - Authorized WRDA 1999
  - Western Hillsboro - Authorized WRDA 1999
  - Caloosahatchee - Authorized WRDA 2000

Highlights -- Lake Okeechobee ASR Pilot Project PMP

- Cost Estimate -- approximately $20 million plus 25% contingency fee
- Scheduled Project Completion -- Sep. 2009
- Major Objectives:
  - Collect data to support regional evaluation of full-scale ASR components of CERP
  - Evaluate ASR capacity (per well), recoverability, and pre- and post-treatment requirements
  - Permit, Design, Construct, and Test Five (5) ASR Well Systems and Evaluate Performance

Lake Okeechobee ASR Pilot Project -- Early Tasks

- Real Estate Evaluations
- Local Hydrogeologic Evaluation
- Fate of Microorganisms in Aquifers Study
- Permitting Evaluation
- Source- and Native-Water Studies
  - Quantity
  - Quality
  - Treatability
- Test Wells at Three Sites

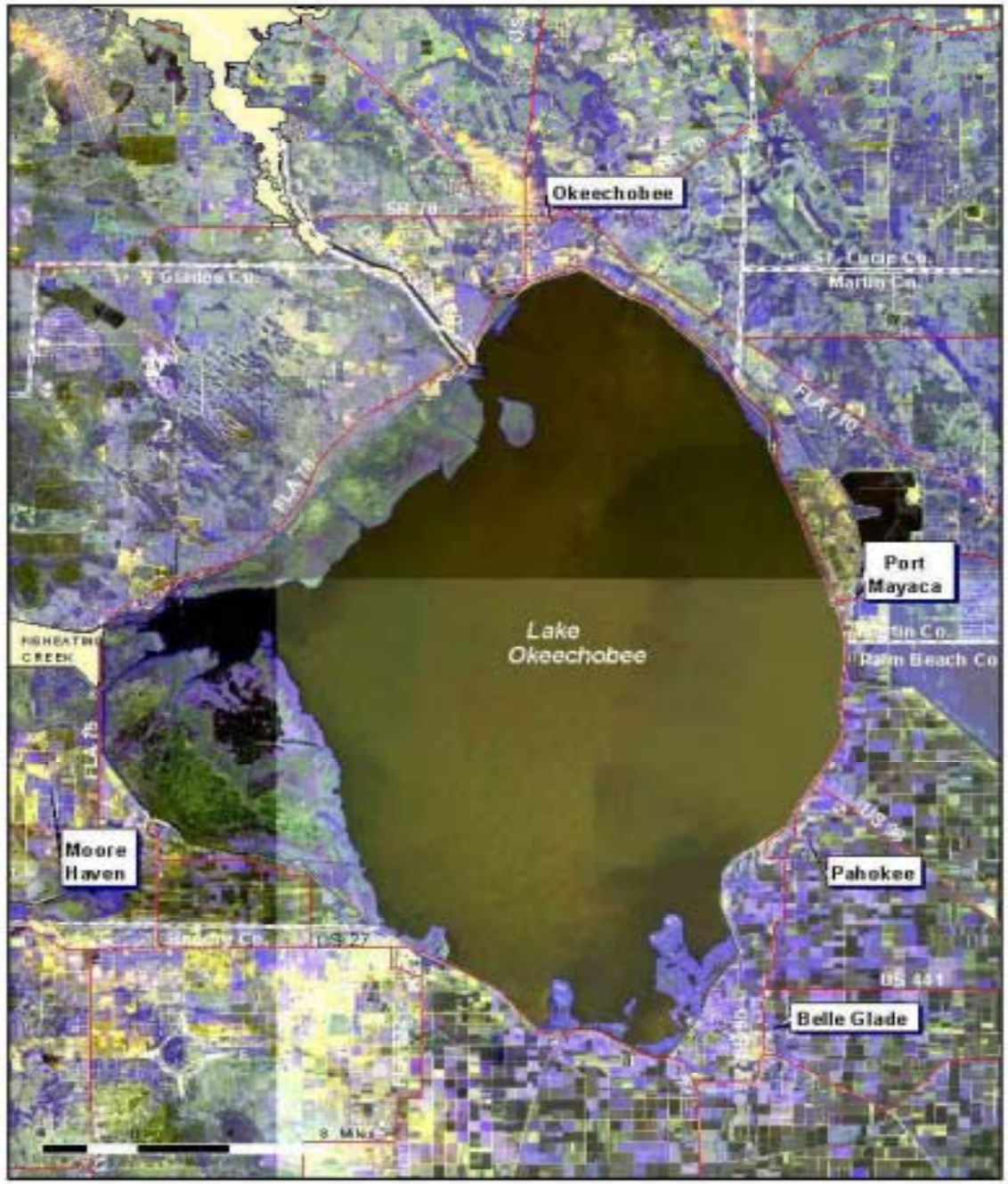


Figure 2. Lake Okeechobee Vicinity Map

Lake Okeechobee ASR Pilot Project -- Later Tasks

- Exploratory/ASR Wells
- Pilot Project Design Report
- Permitting (WUP, UIC, NEPA, NPDES)
- Surface Facility Construction
- Operational (Cycle) Testing
- Technical Data Report
- Project Closeout

Highlights -- Western Hillsboro ASR Pilot Project PMP

- Cost Estimate -- approximately $13 million plus 25% contingency fee
- Scheduled Project Completion -- Jan. 2008
- Major Objectives:
  - Collect data to support regional evaluation of full-scale ASR component of CERP
  - Permit, Design, Construct, and Test Three (3) ASR Well Systems and Pilot Impoundment and Evaluate Performance
  - Evaluate ASR capacity (per well), recoverability, and pre- and post-treatment requirements

Western Hillsboro ASR Pilot Project -- Components

- 3 ASR Wells -- 5 mgd each
- Surface/groundwater water collection and pre-treatment system
- Pilot impoundment (50 acres)
- Pre-discharge water treatment facility
- Surface facilities
- Associated monitor wells

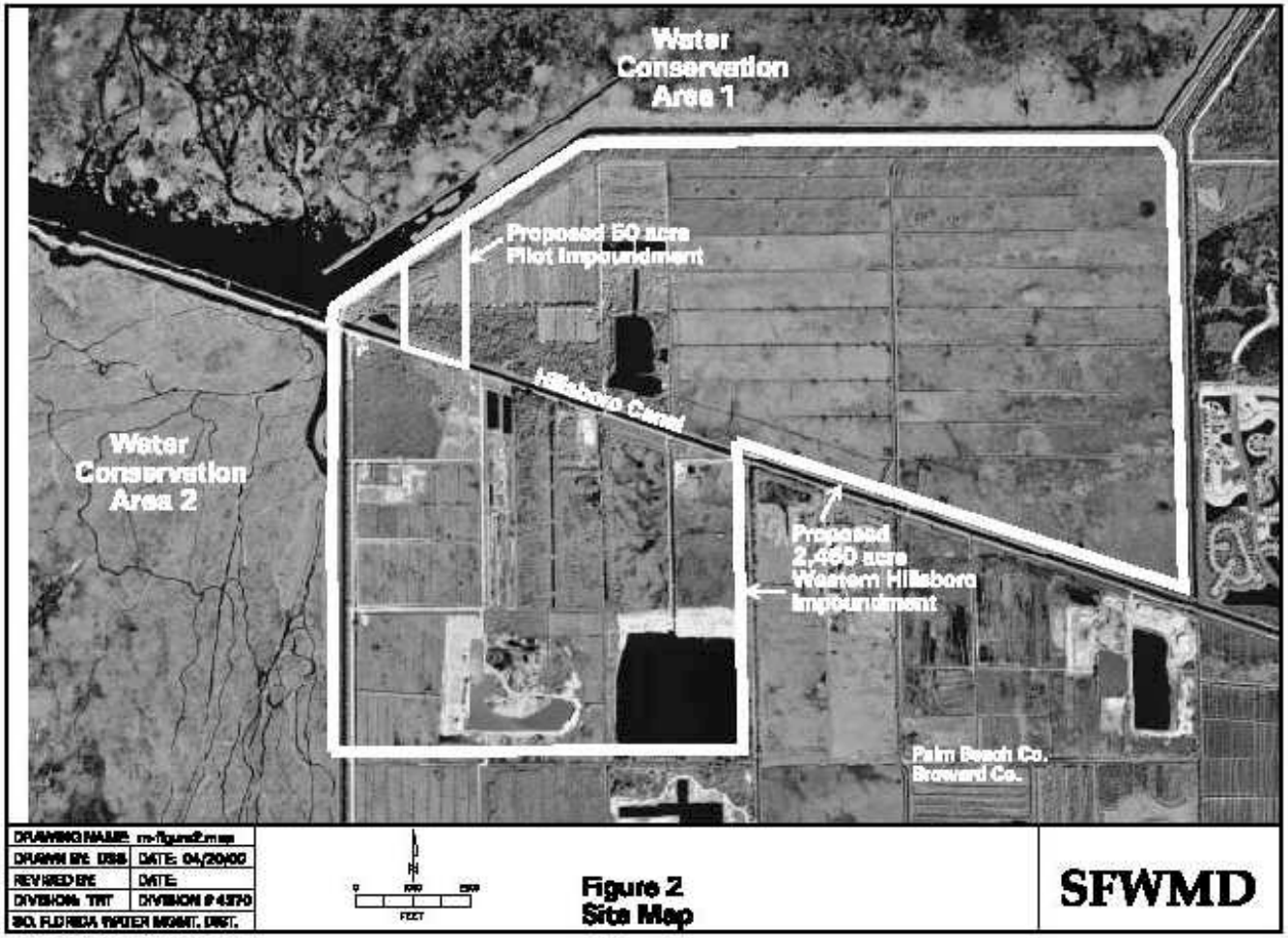


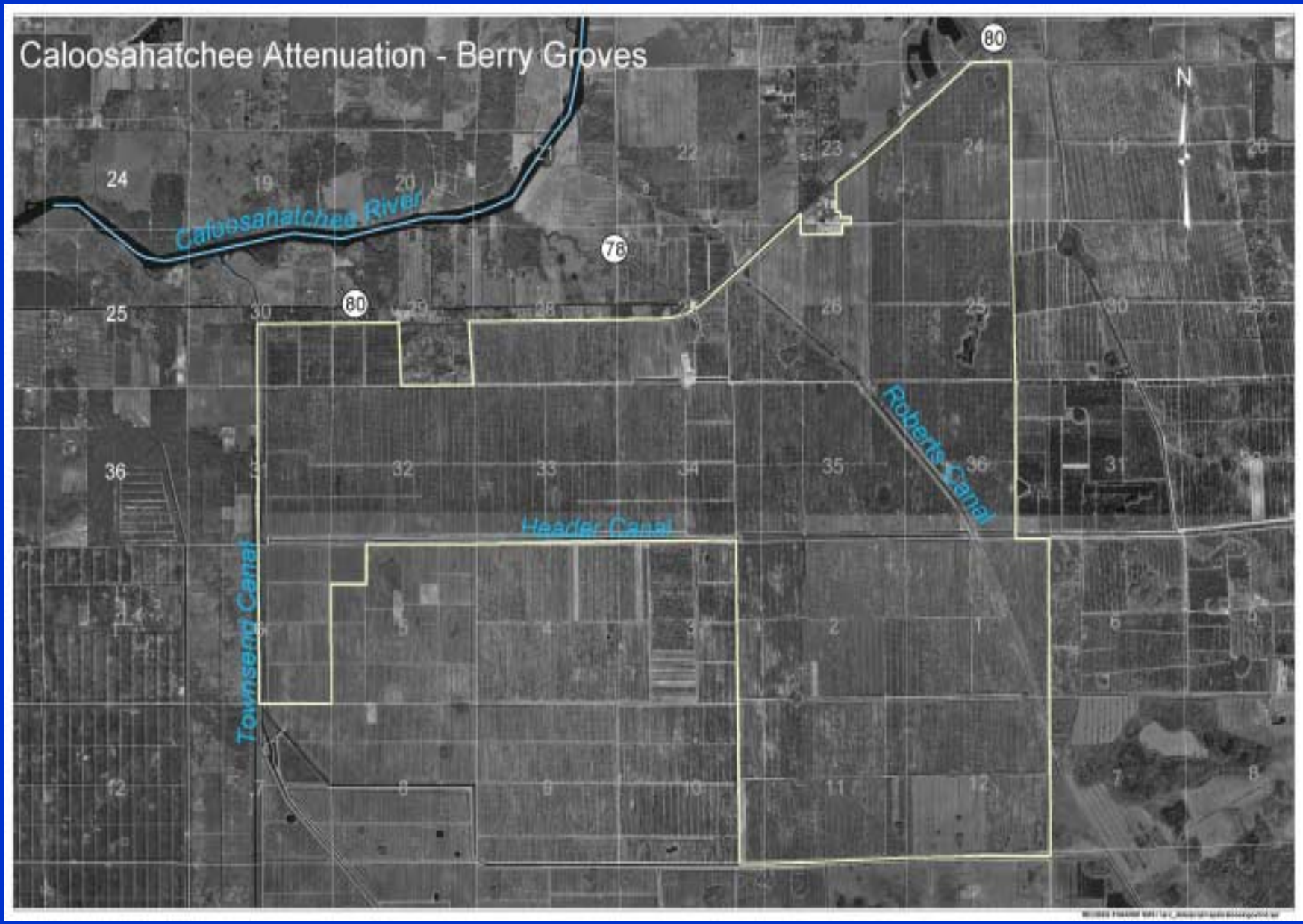
Figure 2
Site Map

Caloosahatchee ASR Pilot Project

- Concurrently conducted with C-43 Reservoir Project; Labelle, FL
- 1 ASR Well, 1 FAS Monitor well
- Surface-water collection, pre-treatment and pre-discharge systems, surface facilities
- Scope of Work being developed
- Scheduled Project Management Plan (PMP) approval November 30, 2001

South Florida Water Management District

Study Area of the Caloosahatchee Water Management Plan


Caloosahatchee Attenuation - Berry Groves
Caloosahatchee River
Header Canal
Townsend Canal
Roberts Canal
80
78
N

Private Sector Opportunities

- Laboratories -- Water Quality Sampling and Analysis of Source-, Native- and Recovered Waters
- Drilling Contractors -- Well Construction and Testing
- General Contractors -- Pre-treatment, Surface Facilities, Impoundments
- Consultants -- Studies, Permitting, Modeling, Design, CM, Testing
- Design/Build ??

Estimated Costs

- CERP was estimated to cost $7.8 billion
- Cost for ASR components: $1.7 billion
- Cost for treatment of water: $0.7 billion, or about 40 percent of the total ASR cost
- Pre-treatment includes ultra-filtration (surface water only)
- Post-treatment includes aeration

ASR -- The Reality

- The defeated ASR Legislation would NOT have allowed water with pesticides, heavy metals, etc. that exceed standards to be put into ASR wells
- CERP ASR assumes all water will be treated prior to recharge into the aquifer
- Defeated legislation dealt only with microorganisms within a specified area, and only if you could demonstrate die-off
- Don’t throw the baby out with the bath water!

Levels of ASR Acceptance

1. **Ban it forever!**
2. **Continue ongoing, methodical approach to implementation -- evaluating results from existing facilities, pilot projects, and additional studies.**
3. **ASR can save the world!**

Join us in Supporting Option 2!!!